

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555-0001

May 18, 2001

**NRC REGULATORY ISSUE SUMMARY 2001-12  
NONCONSERVATISM IN PRESSURIZED WATER REACTOR SPENT  
FUEL STORAGE POOL REACTIVITY EQUIVALENCING  
CALCULATIONS**

ADDRESSEES

All holders of operating licenses for pressurized water reactors.

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to notify pressurized water reactor (PWR) licensees of a possible nonconservatism in the practice of equating the reactivity of spent fuel to the reactivity of fresh fuel in spent fuel storage pool calculations using burnup credit.

BACKGROUND INFORMATION

Since the early 1980s the NRC has accepted the practice of "reactivity equivalencing" in analyses that determine the appropriate placement of fuel assemblies within PWR spent fuel storage pools. "Reactivity equivalencing" equates the reactivity of a fuel assembly that has a particular initial enrichment and burnup combination to the reactivity of a fuel assembly that has a different initial enrichment and zero burnup. This is a fictitious fuel assembly that is used in subsequent analyses.

SUMMARY OF ISSUE

Recent analyses done for NRC by the Oak Ridge National Laboratory (ORNL) have indicated that this practice is acceptable provided the geometric configuration and the conditions under which the equivalency was determined remain unchanged (NUREG/CR-6683 (ORNL/TM-2000/230), "A Critical Review of the Practice of Equating the Reactivity of Spent Fuel to Fresh Fuel in Burnup Credit Criticality Safety Analyses for PWR Spent Fuel Pool Storage," September 2000 [ADAMS Accession Number ML003751298]). However, the equivalent fresh fuel enrichment is often determined for a reference configuration (e.g., an infinite array of storage rack cells in unborated water) and then used for various similar, but not identical, configurations. For example, analyses of checkerboard-type storage configurations in which the spent fuel is placed in alternating locations with higher reactivity fuel assemblies (e.g., fresh or lower burned assemblies) indicate that equivalencing yields nonconservative results (on the order of a few tenths of one percent).

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Likewise, analyses for storage conditions with soluble boron present reveal somewhat more significant nonconservative results. An under-estimation of reactivity of more than 3 percent was observed for an infinite array of equivalent fresh fuel assemblies stored in a soluble boron concentration of 500 parts per million (ppm).

Typical boron concentrations in PWR pools are greater than 2000 ppm and result in a subcriticality margin of about 20 to 25 percent. Therefore, the potential nonconservatism noted above are not a safety concern. However, licensee calculations for spent fuel pool accident conditions such as the misplacement of a fresh fuel assembly in a storage rack designed for spent fuel, or for pools which take partial credit for soluble boron, may be less conservative than originally thought. Licensees are being made aware of this information so that accuracy in spent fuel pool criticality calculations can be maintained.

#### BACKFIT DISCUSSION

This RIS requests no action or written response and is, therefore, not a backfit under 10 CFR 50.109. Consequently, the staff did not do a backfit analysis.

#### FEDERAL REGISTER NOTIFICATION

A notice of opportunity for public comment was not published in the Federal Register because this RIS is informational and requires no action or written response by addressees.

#### PAPERWORK REDUCTION ACT STATEMENT

This RIS does not request any information collection.

If there are any questions about this matter, please contact the person listed below, or the appropriate Office of Nuclear Reactor Regulation project manager for a specific nuclear power plant.

***/RA/***

David B. Matthews, Director  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Technical Contact: Anthony Ulses, NRR  
301-415-1194  
E-mail: [apu@nrc.gov](mailto:apu@nrc.gov)

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LIST OF RECENTLY ISSUED  
NRC REGULATORY ISSUE SUMMARIES

Regulatory Issue Summary No.	Subject	Date of Issuance	Issued to
2001-11	Voluntary Submission of Performance Indicator Data	05/18/2001	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-10	Revisions to Staff Guidance on Notices of Enforcement Discretion	04/02/2001	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-09	Control of Hazard Barriers	04/02/2001	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-08	Operating Reactor Licensing Action Estimates	04/02/01	All power reactor licensees
2000-11, Supp. 1	NRC Emergency Telecommunications System	03/22/01	All holders of operating licenses for nuclear power reactors
2001-07	10 CFR 50.75(f)(1) Reports on the Status of Decommissioning Funds (Due March 31, 2001)	02/23/01	All holders of operating licenses for nuclear power reactors
2001-06	Criteria for Triggering a Review Under 10 CFR 50.80 for Non-Owner Operator Service Companies	02/15/01	All holders of operating licenses for nuclear power reactors